DOCUMENT RESUME

ED 194 130 JC 800 548

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ABSTRACT

Instructional objectives and performance requirements are outlined in this course guide for Welding I, a performance-based course offered at the Community College of Allegheny County to introduce students to shielded arc welding procedures involving stringer beads, butt welds, and lap welds. After introductory material outlining course objectives, texts, and the materials needed by students in class, the guide lists course standards of achievement in eight evaluation areas: weld sizes, starting a weld, uniform flux lines, tie-ins, ending a weld, undercutting, excessive spatter, and cleaning procedures during and after welding. An outline of topics, activities, and tests to be covered during each of the 16 weeks in the semester is then presented, followed by illustrations of satisfactory welding task plates against which student performance can be measured. Finally, the guide presents objectives and instructions for each of the 17 performance tasks and three written tests which form the basis of student evaluation. Grading standards and the forms to be used in keeping student records are appended. (JP)

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ED194130

COMMUNITY COLLEGE OF ALLEGHENY COUNTY

CENTER NORTH

WELDING I

72101

3 Credits/2 Lectures/3 Labs

JC 800 548

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COMMUNITY COLLEGE OF ALLEGHENY COUNTY

CENTER-NORTH

WELDING I
72101

3 Credits/2 Lectures/3 Labs

I. DESCRIPTION

This course includes theory and safety procedures. Students should work to achieve competency in the following shielded metal arc welding procedures: stringer beads, butt welds and lap welds in the flat and horizontal positions. Students should become familiar with oxy-acetylene flame cutting equipment and its application.

II. OBJECTIVES

A. The student should be able to understand the theory of electric arc welding, flame cutting and safety procedures.

B. The student should be able to operate the equipment in the welding lab safely and properly.

C. The student should be taught various welding and cutting techniques.

D. The student should be preparing himself/herself for the coming objectives in Welding II.

III. TEXTBOOK

Welding Skills and Practices, by Giachino, Weeks.

IV. MATERIALS NEEDED BY STUDENTS:

A. Welding Helmet (Flip lense)
B. Welding Gloves
C. Safety Glasses
D. Proper Protective Clothing
E. Pliers

V. SUPPLEMENTARY TEXTS

A. Pocket Welding Guide, Hobart Brothers Company

B. Complete Welding Library, Location: Media Center (Library)

C. Handouts on Welding, Cutting and Safety. Supplied by the Instructor.

IV. STANDARDS OF ACHIEVEMENT

A. Competencies

Seventeen (17) performance-welding tasks performed by students and graded visually by the welding instructor. (See duties and tasks)

Criterion For Evaluation of Competencies (checked by the instructor)

AREA OF EVALUATION	What I Am Looking For
1. Size of welds	
a. Stringer beads	Height and Width
b. Fillet welds	Size of legs, contour of weld face
2. Starting a weld	Height and width same as rest of weld
3. Uniform flux lines	Even spacing and round shape
4. Tie-ins	Restarting a weld in a crater
5. End of weld	Proper filling of a crater at the end of the weld
6. Undercut	Groove at toes of weld
7. Excessive spatter	Small balls of metal and slag around weld area
8. Dirty welds	Improper cleaning during and after welding

B. Written tests (3) -- consisting of:

a. Multiple choice
b. True and false
c. Essay
d. Written tests scheduled throughout the semester including the final exam.

C. Grading -- (See Standards of Achievement and Grading)

1. Upon satisfactory completion of all performance tests and written examinations, the student is assigned a letter grade (see appendix)

2. If the student does not satisfactorily complete the performance tests and written examinations, a grade of I (Incomplete) is assigned and the student should be encouraged to register again for Welding I the following semester.

NOTICE TO INSTRUCTORS:

These chapters on theory and practical application are to be covered during the course. The sequence above is suggested. Changes in the sequence in which it is presented are at the discretion of the instructor to compensate for class size and/or equipment availability.

Explanation of headings under Topic Outline (Page 4)

WEEK:

The Topic Outline is set up for a 16 week course.

PAT CASSETTE TOPIC:

This is programmed Audio-Visual Training, by Hobart. Projector and cassettes are located in the instructors cabinet. 16 MM movies are located in the Media Center. You must give five (5) days notice to reserve for showing.

CLASS TOPIC:

Instructor and student objectives

ELECTRODE SIZE/TYPE:

To be used in relation to the class topic.

PERFORMANCE PLATES:

These are welding test plates performed by the student and graded visually by the instructor. (Pictures of finished plates included)

CHAPTER ASSIGNMENT:

The assignments should be given to the student a week in advance for study.

TEXT:

Welding Skills & Practices

WELDING I

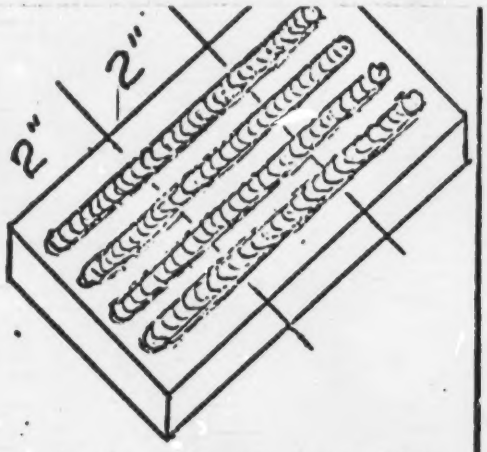
72101

TOFIC OUTLINE

WEEK	PAT CASSETTE TOPIC	CLASS TOPIC	ELECTRODE SIZE/TYPE	PERFORMANCE PLATE	CHAPTER ASSIGNMENT
1	1,2	Introduction: Course Outline Objectives - Safety			2, 21
2		Theory: Oxy-Acetylene and Equipment			22, 33
		Movie : Oxy-Acetylene Safety (By Victor) 16mm			
3		Theory: Setting up and operating oxy-acetylene equipment			22, 33
		Shop : Oxy-acetylene cutting			
		Movie : Oxy-Acetylene Flame Cutting (By Victor) 16mm			
4		Shop : Oxy-acetylene cutting hand and machine			5
5	17	Quiz : (25 Questions) Oxy-Acetylene cutting, safety and theory			7
		Test : Performance, oxy-acetylene cutting			
		Theory: Machines accessories and welding currents			
6	3,7	Theory: Striking an arc stringer beads	1/8 6012		8
7		Shop : Running continuous beads, stopping restarting bead, filling in crater at end of weld	1/8 6012 - 1/8 6010	1	8
8	4	Shop : Padding and weaving	1/8 6012 - 1/8 6012	2	9
	6	Theory: Flat position welds	1/8 6010 -	3	6
9		Shop : Butt joint 1/16" gap			

W(	PAT CASSETTE TOPIC		CLASS TOPIC	ELECTRODE SIZE/TYPE	PERFORMANCE PLATE	CHAPTER ASSIGNMENT
10	12	Quiz 11	(25 Questions) arc welding, machines, accessories and currents			9
		Theory:	Selecting the electrode			
11	5	Shop :	Lap Joints stringer beads and weave beads	1/8 6010 -	4	
12	29	Theory:	Low Hydrogen Electrodes			
		Shop :	Running continuous beads, stopping restarting bead, filling in crater at end of weld	1/8 7018 -	5	
13		Shop :	Butt Joint 1/16" gap	1/8 7018	6	
14		Shop :	Lap joint stringer beads and weave beads	1/8 7018	7	10
(	10	Theory:	Horizontal Position			Study all chapters
		Shop :	Horizontal Beads Padding	1/8 6010 -	8	above for
				1/8 7018	9	final exam
16		Final Exam:	50 questions			
		Shop :	Test Lap Joint			
			Side I - Stringer	1/8 6010		
			Side II - Stringer-weave bead	1/8 7018		
			Stop and restart once			
			Fill crater			

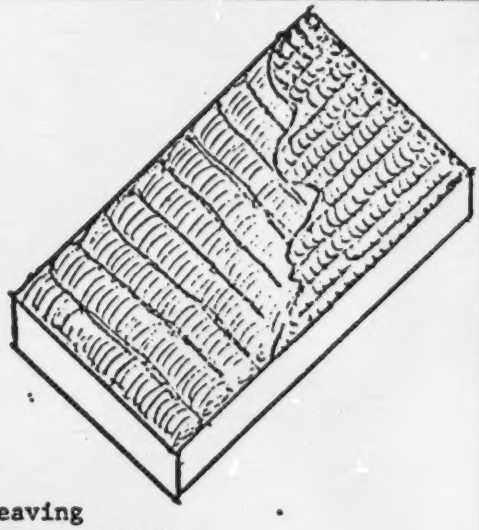
PLATE I



Running continous beads, stopping restarting bead every 2 inches.

Electrode: 1/8 6010 Flat Position

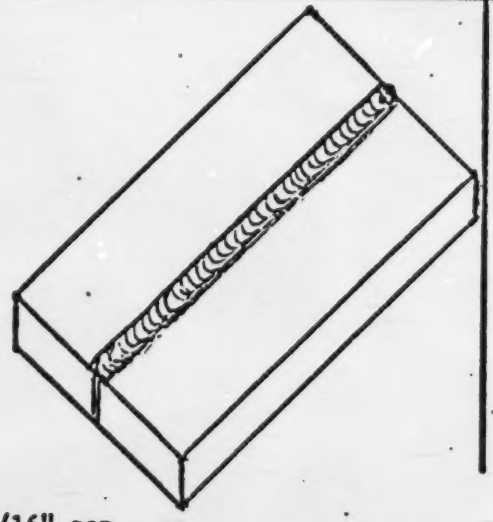
PLATE 2



Padding and weaving
1st Layer: Stringer Beads
2nd Layer: Weave Beads

Electrode: 1/8 6010 Flat Position

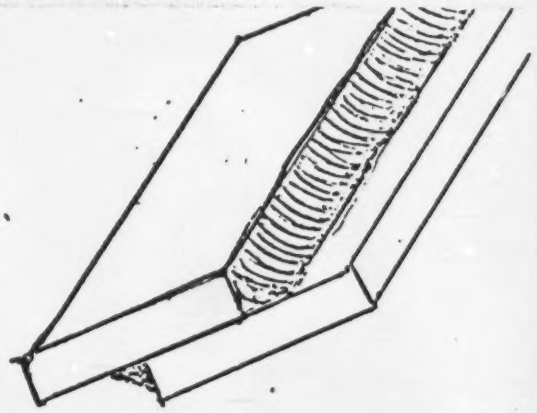
PLATE 3



Butt Joint 1/16" gap

Electrode: 1/8 6010 Flat Position

PLATE 4



Lap Joint
Near Side : 1st pass stringer bead
2nd pass weave bead
Far Side : Stringer bead only
Electrode: 1/8 6010 Flat Position

PLATE 5

Same as Plate 2

Electrode: 1/8 7018 Flat Position

Plate 6

Same as Plate 3

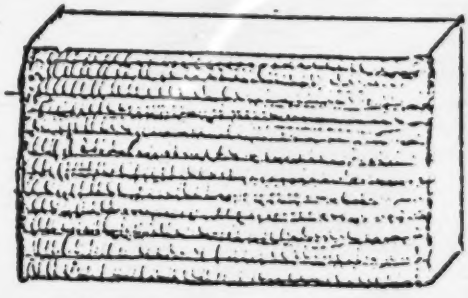
Electrode: 1/8 7018 Flat Position

PLATE 7

Same as PLate 4

Electrode: 1/8 7018 Flat Position

Plates 8-9



Horizontal Beads padding
(plate vertical position)

Electrodes: 1/8 6010 - 1/8 7018 Horizontal Position

DUTIES & TASKS

DUTIES & TASKS

A supply of the Competency Based Duties & Tasks are available in each welding laboratory.

The instructor should issue the duties & tasks to the student as he progresses through the course so that the student knows exactly what he is to do and how his performance will be evaluated.

WELDING I

DUTY: Operating Gas Welding Equipment

TASK: Set Up Portable Or Stationary Oxy-Fuel Equipment

1. Performance Objective

Given oxyacetylene torch, regulators, hoses, check valves, cylinder wrench, oxygen, and fuel cylinders and portable car, set up a portable or stationary outfit. The oxy-fuel equipment will not leak and will operate safely as the manufacturer intended.

Performance Guide

1. Chain cylinders to the cart
2. Remove cylinder caps
3. Crack cylinder valves to clean out foreign particles
4. Attach regulators
5. Install check valves
6. Attach hoses
7. Attach hoses to torch
8. Check for leaks

NOTE: All volatile gasses should be handled with extreme care.

DUTY: Operating Gas Welding Equipment

TASK: Perform Soap And Water And/Or Submerged Leak Test And Repair Gas Welding Equipment

2. Performance Objective

Given gas welding equipment to be tested for leaks, neutral soap and water, perform soap and water and/or submerged leak test. All discovered leaks will be identified, marked with tape, and repaired. Hoses and torch will not leak after repair and test.

Performance Guide

1. Close torch valves
2. Apply normal pressure
3. Mix neutral soap and water (not required for submerged leak test)
4. Brush soapy water over hoses and valves or completely submerge hoses and torch unit
5. Check for bubbles
6. Mark discovered leaks with tape
7. Relieve hose pressure
8. Repair hoses and torch as required
9. Recheck for leaks

DUTY: Operating Gas Welding Equipment

TASK: Change Oxygen, Acetylene Or MAPP Gas Cylinders

3. Performance Objective

Given necessary tools and equipment, change oxygen, acetylene or propane base type MAPP gas cylinders. The oxy-fuel equipment will not leak and will operate safely.

Performance Guide

1. Turn valve on cylinders off
2. Bleed regulator
3. Remove regulator
4. Replace safety cap on cylinder
5. Unchain cylinder
6. Roll to storage area
7. Roll full cylinder to hook up
8. Chain full cylinder to cart
9. Remove safety cap
10. Crack valve to clean out foreign particles
11. Close valve and inspect threads
12. Install regulators
13. Open valve and check for leaks

NOTE: All volatile gasses should be handled with extreme care.

DUTY: Operating Gas Welding Equipment

TASK: Clean Welding And Cutting Tips On Oxy-fuel Equipment

4. Performance Objective

Given oxy-fuel equipment and tip cleaners; clean both cutting and welding tips. Finished tip will be filed square, orifice hole(s) round and free of all foreign particles.

Performance Guide

1. Examine the tip to determine orifice size and condition of tip.
2. Select proper tip cleaners
3. File orifice end
4. Clean tip using a tip cleaner two sizes smaller than the tip orifice. Use straight push-pull action to eliminate egg shaped hole. Gradually increase tip cleaner size to original orifice size.

   (a) Where possible, use long tip cleaners and insert through back of tip
   (b) Clean welding tips and cutting tips that cannot be cleaned from the back through the orifice end.

DUTY: Operating Gas Welding Equipment

TASK: Cut Carbon Steels With Oxy-Acetylene Equipment

5. Performance Objective

Given oxy-acetylene equipment, work order requiring different thicknesses of carbon steels ranging from 1/4" to 1 1/4" make the following type cuts; straight angle; slot bevel; circle; and piercing cuts must meet a tolerance of ± 3/32".

Performance Guide

1. Select safety equipment
2. Determine grade of steel using (a) spark stream; (b) code number
3. Measure and mark with soapstone
4. Select proper torch tip
5. Check all fittings, hoses, regulators for proper condition
6. Adjust regulators, light, and adjust torch
7. Cut metal according to instructions on work order

DUTY: Operating Gas Welding Equipment

TASK: Take A 50 Question Written Test On Safety And Theory Of Oxy-Acetylene Equipment

6. Performance Objective

Pass a 50 question written test on the safety and theory of oxy-acetylene equipment with 75% or more of the questions correct.

DUTY: Operating Shielded Metallic Arc Welding Equipment

TASK: Running Continuous Beads
Break - Restart - Fill Crater

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7. Performance Objectives

Given a 1/4" x 3" x 6" plate and 1/8" diameter E-6012 electrodes, weld continuous beads (4 beads 6" long) breaking arc and restarting every two inches and filling crater at the end of each complete bead. The finished beads should show little evidence of breaking and restarting and crater should be filled to bead height.

Performance Guide

1. Select safety equipment
2. Select tools and materials
3. Set up equipment
4. Clean and position for welding
5. Turn on and adjust welding machine
6. Weld plate according to specifications

DUTY: Operating Auxiliary Equipment and Tools

TASK: Chip Slag Using Chipping Hammer

8. Performance Objectives

Given a welded joint and chipping hammer; remove slag from weld. Weldment must be free of all removable slag.

Performance Guide

1. Select safety equipment
2. Select chipping hammer
3. Check condition of chipping hammer
4. Chip slag from weld using side by side methcd
5. Brush to clean as required

DUTY: Operating Shielded Metallic Arc Welding Equipment

TASK: Padding In The Flat Position On Carbon Steel

9. Performance Objectives

Given a 3/8" x 3" x 6" plate and 1/8" diameter E-6012 electrodes, pad in the flat position using stringer beads and weave beads (alternate layers). Each layer should be uniform in height and width.

Performance Guide

1. Select safety equipment
2. Select tools and materials
3. Set up equipment
4. Clean and position for welding
5. Turn on and adjust welding machine
6. Weld plate according to specifications

DUTY: Set Up, Tack, And Weld Metal Processing Projects

TASK: Set Up And Tack Weld Open Butt Joints

10. Performance Objective

Given two 3/8" x 2" x 6" plates and welding equipment, set up, align, and tack weld open butt joints. Plates must be spaced to a 1/8" opening.

Performance Guide

1. Select safety and welding equipment
2. Clean plates
3. Align plates on flat surface
4. Space plates to proper root opening
5. Select correct rod and/or electrode and set up equipment
6. Place 1/2" tack at each end

WELDING I

DUTY: Set Up, Tack And Weld Metal Processing Projects

TASK: Set Up And Make An Open Butt Weld In The Flat Position

11. Performance Objective

Given two 3/8" x 2" x 6" plates and a SMAW machine, set up and align plates for an open butt joint. Perform an open butt weld with 1/8" diameter E-6010 electrodes using the whipping technique. Finished weld should not exceed 1/16" height above the surface of the plates with little or no undercut.

Performance Guide

1. Select safety and welding equipment
2. Select two pieces of 1/8" x 2" x 6" plates
3. Clean as necessary
4. Align plates on flat surface
5. Space plates to proper root opening (1/8")
6. Select correct electrode and set up machine
7. Place 1/2" tack at each end
8. Make open butt weld

WELDING I

DUTY: Operating Shielded Metallic Arc Welding Equipment

TASK: Take A 50 Question Test On Arc Welding Safety, Machines, Accessories And Currents

12. Performance Objectives

Pass a 50 question test on the safety and theory of shielded metallic arc welding with 75% or more of the questions correct.

DUTY: Set Up Tack And Weld Metal Processing Projects

TASK: Set Up And Tack Weld Lap Joints

13. Performance Objective

Given two 3/8" x 2" x 6" plates, welding equipment and materials; tack weld lap joints. Plates will be aligned properly and tacked sufficiently to prevent distortion as per specifications.

Performance Guide

1. Select safety and welding equipment
2. Select clamps, fixtures and tools
3. Set up, align, and clamp work pieces in position. (Plates will be on centers of each other when overlapped.)
4. Select correct rod and/or electrodes and set up welding machine
5. Place 1/2" tack at each end

DUTY: Set Up, Tack, And Weld Metal Processing Projects

TASK: Set Up And Make A Lap Weld In The Flat Position

14. Performance Objective

Given two 3/8" x 2" x 6" plates and a SMAW machine, set up plates for a lap weld. Perform a lap weld with 1/8" diameter E-6010 electrodes using the whipping technique. Finished weld one side will have a 1/4" equal leg fillet weld. The other side will have a 1/4" weld with a weave cover pass using the crescent motion. Finished weld will be a 3/8" equal leg fillet weld.

Performance Guide

1. Select safety and welding equipment.
2. Select clamps, fixtures, and tools
3. Select two pieces of 3/8" x 2" x 6" plate
4. Clean as necessary
5. Align plates on flat surface
6. Select correct electrode and set machine
7. Place 1/2" tack at each end
8. Place plates in fixture and perform lap welds to specifications

WELDING I

DUTY: Operating Shielded Metallic Arc Welding Equipment

TASK: Running Continuous Beads - Break Arc - Restart - Fill Crater

15. Performance Objectives

Given a 1/4" x 3" x 6" plate and 1/8" diameter E-7018 electrodes, weld continuous beads (4 beads 6" long) using the free arc technique break arc and restart every two (2) inches and fill crater at the end of each complete bead. The finished beads should show little evidence of breaking and restarting and the crater should be filled to bead height.

Performance Guide

1. Select safety equipment
2. Select tools and materials
3. Set up equipment
4. Clean and position for welding
5. Turn on and adjust welding machine
6. Weld plate according to specifications

DUTY: Set Up, Tack, And Weld Metal Processing Projects

TASK: Set Up And Make An Open Butt Weld In The Flat Position

16. Performance Objective

Given two 3/8" x 2" x 6" plates and a SMAW machine, set up and align plates for an open butt joint. Perform an open butt weld with 1/8" diameter E-7018 electrodes using the free arc technique. Finished weld should not exceed 1/16" height above the surface of the plates with little or no undercut.

Performance Guide

1. Select safety and welding equipment
2. Select two pieces of 3/8" x 2" x 6" plate
3. Clean as necessary
4. Align plates on flat surface
5. Space plates to proper root opening (1/8")
6. Select correct electrode and set up machine
7. Place 1/2" tack at each end
8. Make open butt weld

DUTY: Set Up, Tack, And Weld Metal Processing Projects

TASK: Set Up And Make A Lap Weld In The Flat Position

17. Performance Objective

Given two 3/8" x 2" x 6" plates and a SMAW machine, set up plates for a lap weld. Perform the lap weld with 1/8" diameter E-7018 electrodes using the free arc technique. Finished weld one side will have a 1/4" equal leg fillet weld. The other side will have a 1/4" weld with a weave cover pass, (using the crescent motion). Finished weld will be a 3/8" equal leg fillet weld.

Performance Guide

1. Select safety and welding equipment
2. Select clamps, fixtures, and tools
3. Select two pieces of 3/8" x 2" x 6" plate
4. Clean as necessary
5. Align plates on flat surface
6. Select correct electrode and set machine
7. Place 1/2" tack at each end
8. Place plates in fixture and perform lap welds to specifications

DUTY: Operating Shielded Metallic Arc Welding Equipment

TASK: Padding In The Horizontal Position On Carbon Steel

18. Performance Objective

Given a 3/8" x 3" x 6" plate and 1/8" diameter E-6010 electrodes, using the whipping technique, pad in the horizontal position. (Plate held in fixture in the vertical position). Run first layer from left to right, and second layer from right to left. Each layer should be uniform in height and width.

Performance Guide

1. Select safety equipment
2. Select tools and materials
3. Set up equipment
4. Clean and position for welding
5. Turn on and adjust welding machine
6. Weld plate according to specifications

DUTY: Operating Shielded Metallic Arc Welding Equipment

TASK: Padding In The Horizontal Position On Carbon Steel

19. Performance Objective

Given a 3/8" x 3" x 6" plate and 1/8" diameter E-7018 electrodes, pad in the horizontal position using the free arc technique. (Plate held in fixture in the vertical position). Run first layer left to right, and second layer right to left. Each layer should be uniform in height and width.

Performance Guide

1. Select safety equipment
2. Select tools and materials
3. Set up equipment
4. Clean and position for welding
5. Turn on and adjust welding machine
6. Weld plate according to specifications

WELDING I

DUTY: Operating Shielded Metallic Arc Welding Equipment

TASK: Take A 50 Question Written Test On The Safety And Theory Of Operating Shielded Metallic Arc Welding, Welding Positions, Electrodes And Currents

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20. Performance Objective

Pass a 50 question written test on the safety and theory of shielded metallic arc welding with 75% or more of the questions correct.

STANDARDS OF ACHIEVEMENT AND GRADING

STANDARDS OF ACHIEVEMENT & GRADING

Within the framework of this competency based Welding I course, one of four possible grades is assigned to the student at the end of the term. The four grades are A, B, C, and I (Incomplete).

The following three (3) pages are guides to be used by the instructor for assigning A, B, or C based on his evaluation of the critical areas of welding as the completed duties & tasks are completed by the student.

A grade of I (Incomplete) is to be assigned to any student not satisfactorily completing the duties & tasks and the written examination. Students who have numerous incomplete duties & tasks should be encouraged to re-register for Welding I the following semester.

A student who does not intend to complete the duties & tasks and does not want college credit for the course should be advised to audit the course. By doing so, the student is essentially taking the course on a non-credit basis. The student should be made aware of this possibility and inform the instructor of his decision at the beginning of the term.

SUPPLEMENT TO STANDARDS OF ACHIEVEMENT

Under Criterion of Evaluation (page 2) to ascertain a grade level from "A" to "C".

"C" Student

1. a. Stringer beads - - The height and width may vary from bead to bead, but it would still be in the tolerance of acceptability.

   b. Fillet weld - - - They will vary from bead to bead also with the leg size slightly smaller or larger and the contour of the face changing slightly from bead to bead.

2. Starting a weld - - - They may be higher or wider or narrower, but also acceptable.

3. Flux lines - - - - - - Some rounded shapes and arrow shapes. The spacing would vary with speed or placement of the electrode in the puddle.

4. Tie-ins - - - - - - - Some tie-ins overlap crater properly or overlap too far.

5. End of weld - - - - - The crater not quite filled or overfilled.

6. Undercut - - - - - - - Slight undercut is okay within an acceptable tolerance and may be some overlap.

7. Excessive spatter - - Fluctuating arc length and amperage setting.

8. Dirty welds - - - - - Weld not always clean.

STUDENT RECORDS

STUDENT RECORDS

There are two basic forms and records to be kept by the instructor. The forms are as follows:

1. Student Record Class Roster

   This form is to be used by the instructor to record the date completed and the grade received by the student on each task.

2. Student Proficiency Record

   Each welding laboratory will contain a file of student folders which will contain a proficiency record for each student. As the student completes each task, the instructor is to record the date completed and to certify the date and competency by signing in the appropriate space.

WELDING I - 72-101 - COMMUNITY COLLEGE OF ALLEGHENY COUNTY - CENTER-NORTH

STUDENT NAME _____ SOCIAL SECURITY NUMBER _____

School Stamp

This is to certify that the above named student has demonstrated proficiency in the following tasks:

Compentency Task	Date Completed	Instructor
1. Set up portable or stationary oxy-fuel equipment		
2. Perform soap and water and/or submerged leak test and repair gas welding equipment		
3. Change oxygen, acetylene or MAPP gas cylinders		
4. Clean welding and cutting tips on oxy-fuel equipment		
5. Cut carbon steels with oxy-acetylene equipment		
6. Take a 50 question written test on safety and theory of oxy-acetylene equipment		
7. Running continuous beads, break - restart - fill crater		
8. Chip slag using chipping hammer		
9. Padding in the flat position on carbon steel		
10. Set up and tack weld open butt joints		
11. Set up and make an open butt weld in the flat position		
12. Take a 50 question test on arc welding safety, machines, accessories and currents		
13. Set up and tack weld lap joints		
14. Set up and make a lap weld in the flat position		
15. Running continuous beads, break - restart - fill crater		

Compentency Task	Date Completed	Instructor
16. Set up and make an open butt weld in the flat position		
17. Set up and make a lap weld in the flat position		
18. Padding in the horizontal position on carbon steel		
19. Padding in the horizontal position on carbon steel		
20. Take a 50 question test on the safety and theory of operating shielded metallic arc welding, welding positions, electrodes, and currents		

School Official Signature

Student Signature

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